Telescience Resource Kit (TReK)

Engineering Solutions for Space Science and Exploration

TReK is a suite of software applications and libraries that can be used to monitor and control assets in space or on the ground. TReK was originally developed for the International Space Station program, where it continues to support science experiments led by researchers around the globe. The TReK system has proven its worth during more than 2,000 International Space Station investigations led and conducted by representatives of more than 95 countries, and has successfully supported a variety of other NASA missions and programs.

The Payload Operations Integration Center (POIC) at NASA's Marshall Space Flight Center in Huntsville, Alabama, provides the capability for payload users to monitor and operate their payloads at their remote lab facilities. In this environment, TReK provides local ground support services and an interface to use remote services — currently serving International Partner sites, Telescience Support Centers, and U.S. Investigator sites in more than 40 locations worldwide.

TReK helps package experiment data so it may be easily routed through the space station’s communications network to deliver it to the ground at Marshall, then to the science teams’ home facilities.

The space network includes both ground stations and an orbiting satellite system. Experiment data can range from individual numbers to large files of data, including video, for delivery anywhere in the world.

General Capabilities

- Communication: Support for Consultative Committee for Space Data Systems (CCSDS), Internet Protocols (Unicast, Multicast, Transmission Control Protocol (TCP) Listener, TCP Server and TCP Client) and Serial interfaces.
- Packet Support: Create, populate, build and decompose packets; includes support for pre-defined and custom headers and packets.
- Data: Retrieve, process, record, playback, forward and display ground-based data or telemetry data.
- Command: Create, modify, send, track and record commands.
- Metadata: Metadata, including packet definitions and limit information, can be stored in one or more databases or files. Various formats and mechanisms are provided to define, import and export metadata including custom headers and packets.
- File Transfer: Send and receive files using CCSDS File Delivery Protocol (CFDP).
• Delay Tolerant Networking (DTN): Configure and manage (start, stop, monitor) an Interplanetary Overlay Network (ION) DTN node.

• Application Programming Interface (API): Core libraries are C++ with wrappers for ANSI-C and .NET support. API provides a bridge for users to develop software to access and extend services.

• Environments: Development, test, simulations, training and flight; includes standalone training simulators.

History of TReK
TReK software has been in use for International Space Station science payloads since 2000, aiding communications between the Payload Operations Integration Center at Marshall and science teams around the world. To date, TReK has supported more than 2,000 ISS investigations from more than 95 countries. TReK previously served the WB57 Ascent Vehicle Experiment (WAVE), recording high-definition video and near-infrared images during launch vehicle liftoff and ascent, and supported testing and flight operations of the Fast Affordable Science and Technology Satellite (FASTSAT), developed by Marshall, the U.S. Department of Defense’s Space Test Program and industry partners and launched in 2010 to carry six key science experiments to orbit. TReK provided ground system services on FASTSAT mission operations workstations and at remote sites.

TReK applications enable scientists to customize communications to their specific environment because each payload is unique, and the data acquired can change the world. For more information, visit:

https://trek.msfc.nasa.gov

For more information about Marshall technology business partnerships, visit:

www.nasa.gov/centers/marshall/about/business.html